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**Trade Elasticities and De-Industrialization Phenomena in Europe:
Case Studies in Spain, Italy and France**

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Abstract

The number of member States in the European Union has been growing for the last 20 years and now includes 28 countries. The euro zone includes 19 countries, some of which (especially Greece, Spain or Portugal) have important price-competitiveness problems. Despite the EMU mechanism and the free movement of capital assets in Europe, which was supposed to help countries reach high competitiveness, some European countries, mostly the countries of the South of Europe, today suffer from a big trade deficit. The aim of this paper is to explain the cause of these deficits and specially to answer the question of the long run specialisation weakness or the short run competitiveness weakness. We compute export price elasticities and income elasticities of four European countries (France, Germany, Spain, and Italy) to analyse the Southern European countries' hardship caused by structural, institutional, or conjectural problems with their trade balance? The key question deals with industrial deficits and the de-industrialisation phenomena throughout Europe. Are industrial sectors necessary for the increase in economic performances among international markets? Must all European countries specialise in industrial sectors only, in order to export? But if we enlarge the analysis to take into account the service exports (such as travel or companies' services), it will be possible to link service exports and industrial exports in a positive dynamic.

Key words:

Trade balance, income elasticity, price elasticity, price competitiveness, non-price competitiveness, de-industrialization.

JEL : E12, F10, F12, F14, F17

1. INTRODUCTION:

For more than 20 years, Europe has chosen to open itself up progressively to 28 countries. Launched in 1999, the euro is today used by 18 countries as a single currency. However, deciding to establish an Economic and Monetary Union (EMU) while the Optimal Monetary Zone (OMZ) conditions (Mundell, 1961, Mac Kinnon, 1963, Kenen, 1969) were far from being met (a significant European budget and a considerable amount of labour mobility), most of the countries of the euro zone, with the exception of northern European countries, ended up with large trade deficits. The rise of emerging economies in world trade explains some of these deficits (particularly in the car industry). The amount of deficit observed is such that it leads us to question whether these countries observe, on a more structural level, non price competitiveness losses that would be due to the de-industrialisation of the economy. Firstly, these deficits had easily been financed thanks to the mobility of capital. But the increase in European public debt (originating from a lack of competitiveness and the subprime crisis), provoked for the first time since 1992, speculation against the European single currency and left doubt as to whether or not there was a possibility of European countries defaulting, when they had been thought to be completely secure. All the countries in deficit are now affected by this mechanism of distrust (Borensztein and al, 2009, Borio and al, 2010). For the most affected, Greece and Cyprus, the possibility of coming out of the euro zone is under discussion. But if a country must leave the euro zone, it undermines the whole mechanism.

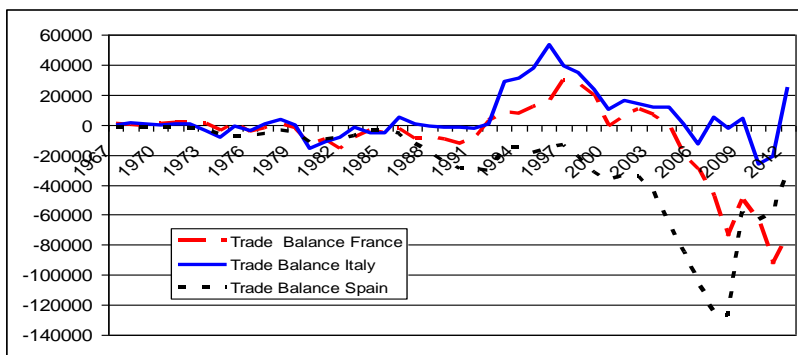
The aim of this paper is to shed light on the trade integration of the main countries of the euro zone that have been experiencing growing deficits since the middle of the year 2000: France, Italy, Spain, and Greece. For these countries the foreign trade should have been able to balance itself out with the progressive development of their non-price competitiveness. Seemingly, the countries from the south of Europe have particularly suffered a loss of competitiveness, driven by the increase in the value of the euro during these years. In the first section of this paper, we analyse the structure of the three European countries' trade deficit, by studying the effect of the overvaluation of the euro on their trade and asking whether it is essential that these countries maintain a strong industrial specialisation. In the second section of this paper, for these countries, we estimate volume and price elasticities of their exports in order to determine the economic aspects requiring stimulation to straighten out the trade balance. We focus on finding out which country has the strongest price elasticity and therefore which is the most vulnerable to price competitiveness. In conclusion, our study offers short, medium, and long term economic policy recommendations which aim to define the new outlines of an economic Europe based on a new impetus of European cooperation.

2. TRADE DEFICITS AND DESINDUSTRIALISATION

Since 2001, we observe that all advanced countries, and especially European countries (France, Spain and Italy), are becoming more and more affected by large

trade deficits (**Graph 1**). These heavy deficits can be explained by the losses of price competitiveness but also by non price competitiveness (lack of innovation and lack of quality). The freedom of the capital movements and the creation of the single currency had, at the beginning, easily financed these trade deficits (Bordo and al 2001). But since the subprime crisis, the European deficits have become more and more unsustainable. On the contrary, we see that the CEECs, which were very deficient in the early 90s, are now making significant trade surpluses (Czech Republic, Slovakia, and Hungary in particular) (Aglietta and al, 2003, Benacek, 2005, Baulant and al, 2013).

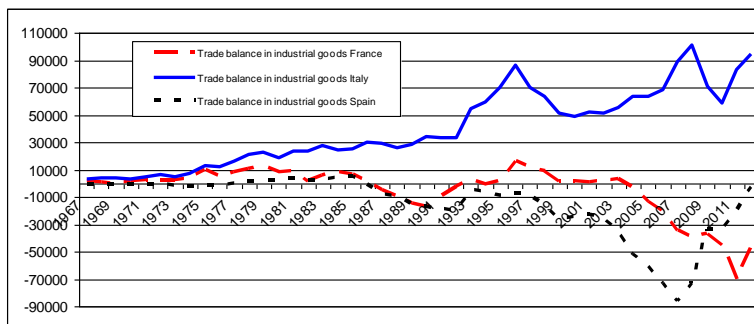
Graph 1: Trade balance for France, Italy and Spain in millions of dollars from 1967 to 2012.



Source: Chelem Balance of Payment Data Base, CEPII, October 2014

Despite her trade deficit, it is important to highlight that Italy is experiencing a surplus in her industrial goods balance and that her industrial surplus (**Graph 2**) is mainly due to a surplus in the high added value sectors such as "metal products". Since 2000, the trade deficit of Spain (total and industrial) mainly comes from a strong increase in imports (138%) when at the same time; the trade deficit of France can mainly be explained by a lower progression of the export of goods (97%).

Graph 2: Manufactured products balance of France, Italy and Spain In millions of dollars from 1967 to 2012



Source: Chelem Trade Data Base, CEPII, October 2014

If we study the exports of the three European countries between 2000 and 2011 using different geographical zones (Worldwide, European Union countries, Non

European countries), we observe a strong progression of the Spanish exports (163%) toward the world which is almost as much as that of Germany. And the Spanish exports progression toward extra-European Countries is the most important of all the European countries (216%) (**Table 1**). The total French exports toward extra-European countries progressed slightly (97%), as well as French exports toward the 28 European countries (82%). Within the same time frame, the progression of the 4 CEEC's exports is inversely much greater and much higher than that of Germany, especially for Slovakia (575%) and for Poland, or the Czech Republic (480 and 430% respectively). The progression is more moderate for Hungary (273%).

Table 1: The progression of the Nominal Exports for the 4 countries from 2000 to 2011 (%)

| | France | Italy | Spain | Germany |
|------------------|---------------|--------------|--------------|----------------|
| UE (28) | 82.0 | 100.4 | 143.1 | 140.1 |
| Extra EU | 125.0 | 144.7 | 216.1 | 211.1 |
| Worldwide | 96.9 | 118.1 | 163.2 | 165.6 |

Source: Chelem Trade Data Base, CEPIL, May 2013

In 2011, the country which has the most trading with Europe is still Spain (with 67% of her exported goods) (**Table 2**). Italy and Germany, with 44.8 and 42.1% respectively, are more concerned with extra-European export whereas France and Spain are more reserved.

Table 2: The weight of each zone in the exports of the 4 countries in 2011(%)

| | France | Italy | Spain | Germany |
|------------------|---------------|--------------|--------------|----------------|
| UE 28 | 60.4 | 55.2 | 67.0 | 57.9 |
| Extra EU | 39.6 | 44.8 | 33.0 | 42.1 |
| Worldwide | 100.0 | 100.0 | 100.0 | 100.0 |

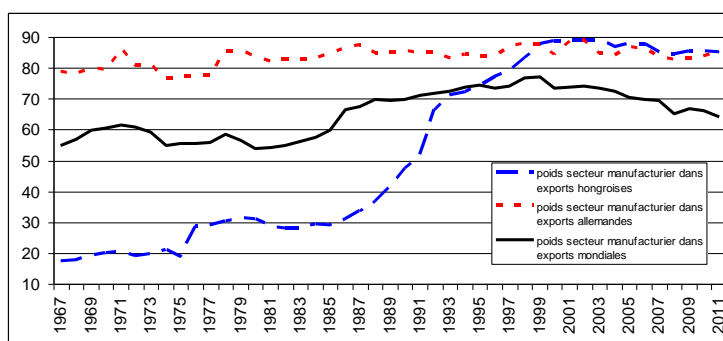
Source: Chelem Trade Data Base, CEPIL, May 2014

2.1 A more and more competitive industrial specialisation

For France and Spain, the trade balance is mainly explained by the trade of industrial goods. The industrial goods trade deficits for the two European countries are today becoming worrying because since the 80's and 90's, more than 70% of the European countries' trade is concerned with these industrial goods. The intra-zone trade of these industrial goods was supposed to be achieved on a non price competitiveness level according to the goods' differentiation mechanism (Krugman, 1989, Aghion et al, 2000) due to the goods quality (Germany) or variety (the other European countries).

In 2011, the exports of manufactured goods even represented 85 and 82% of the German and Italian exports (**Graph 3 and Appendix A.1**) while industrial goods reached not more than 79 and 75% of French and Spanish exports. For these two countries, the agricultural exports and food goods exports are still a major part of the total exports.

Graph 3: The weight of the manufacturing goods exports in the total exports of each country from 1967 to 2011 (in %)



Source: Chelem Trade Data Base, CEPII, May 2014

At the “heart” of these industrial good exports, the "metal product sector"¹ exports in 2011 represented 64% of German manufacturing exports when they totalled only 55, 52, and 51% of manufacturing exports for France, Italy and Spain respectively.

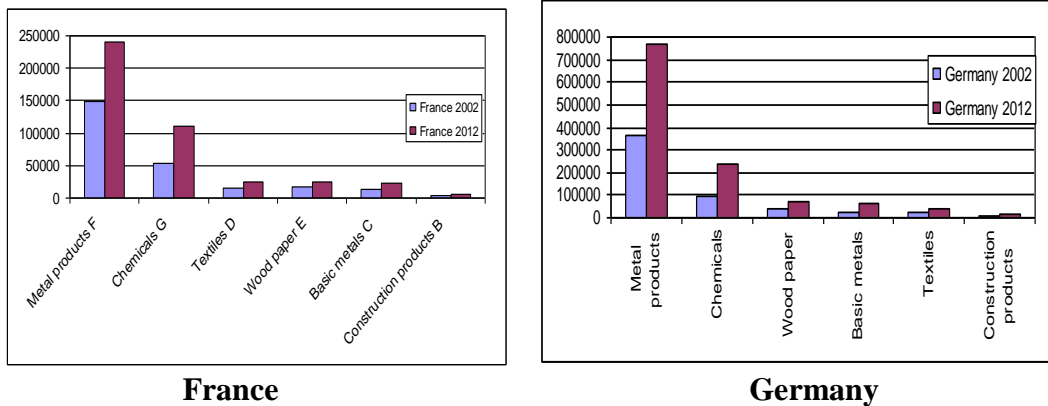
If we carry on our comparison with the Emerging European countries like the CEEC’s (**Table 3 and Appendix A.2**), we observe the quantity of manufactured goods exported from the Czech Republic and Slovakia to be 70 and 69% total exports, respectively. Manufactured goods exports also reach 62 and 54% of the Hungarian and Polish exports, over and above that of Italy and Spain. Naturally, as in (an) absolute value, the metal product exports (as for the industrial exports) of the CEEC’s are still lower than for the 4 European countries studies. The Czech Republic, the best placed country, only exports 92 billion dollars in this mechanical sector; whereas for the worst placed country in the Euro zone, Spain, the exports are 113 billion dollars in this sector. Even if the «metal product» sector did not only concern the high brand goods (M Fortes (2012)), we observe that the CEEC’s, and more generally the Emerging Economies, have caught up over the course of the years 2000 in this particularly dynamic sector. Thus the Hungarian, Czech and Slovak «metal product» exports now surpass that of metal product exports of Germany.

2.1.1 The key role of the “Metal Product” and “Chemical” exports

Two sectors are especially “high added value” in the industrial trade: the “metal products sector” and the “chemical sector” (Lafay, 1979). The four European countries studies are well placed in these two sectors as they are the first and second export products of these countries. Over ten years, the weight of the metal product goods trade has tended towards a decline in the three European countries, whereas the chemical goods trade has increased slightly (**Graph 4**).

¹ See de Saint Vulvry (2008) and Appendix 1 for the goods which belong to “metal product” sector in Chelem data base.

Graph 4: Metal Products (F) and Chemical Products (G) Exports for France and Germany in 2001 and 2011



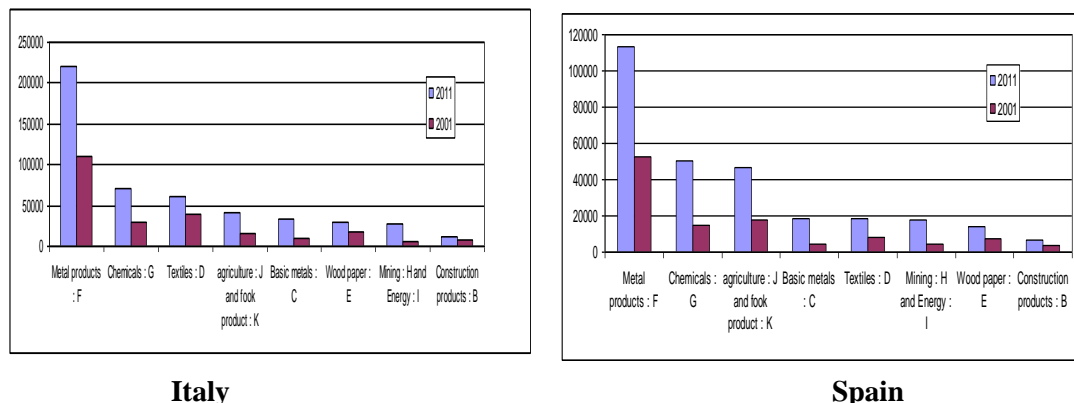
Source: Chelem Trade Data Base, CEPII, May 2014

Hence, the competition from Emerging Countries seems stronger in the “metal product” industry than in the “chemical” industry. In 2011, these two key sectors represented 71% of the German exports, 62% of the French exports but 56 and 55% respectively of the Italian and Spanish exports. On the first four exporting sectors, Germany is always far ahead (of the German exports the French exports represent between 30 and 46%, the Italian exports between 28 and 49%, and the Spanish between 14 and 54%). For agriculture and food goods, France is at 90% of the German exports and Spain is at 54%. It should be noted that the Italian exports in the steel and wood and paper industries exceed that of France. While France reinforces her third sector (agriculture and food goods: 11 to 13% of exports), Germany has been able to keep three equal, large, and relatively divers sectors: agriculture and food goods, the steel industry, and the wood and paper industry (each representing 5 to 6% of trade). France emerges as more specialised than Germany and therefore more vulnerable in the two leading sectors. In 2001, the three foremost exports for each country represent 79 and 78% of the German and French exports but only 74 and 73% of the Spanish and Italian exports. Ten years later, the three strongest export sectors have slowed down for all of the European countries; dropping to 77% for Germany, 75% for France, 71% for Spain, and 67% for Italy.

From an industrial trade point of view, the implementation of the EMU seems to have reinforced the quality of German specialisation. The 2 strong sectors only drop by 2% in German exports whereas they drop by 3% France and Spain and they drop by 6% Italy. But, for the latter, the drop in the strong export sectors is accompanied with a high diversification of exports which seems to be a dynamic strategy of exports differentiation (**Graph 5**). As for France and Germany, Italy and Spain mainly export metal products (45 to 42% for Italy and 48 to 36% for Spain) and chemical products (12 to 14% for Italy and 13 to 17% for Spain). However, Italy also exports textiles (the country’s third export sector) even if the strength of this sector, on the whole, has

been declining for the last decade (from 16 to just 12%). Spain however has reinforced exportations in “agriculture and food goods” from 15 to 16% of total exports.

Graph 5: Metal Products (F) and Chemical Products (G) Exports for Italy and Spain in 2001 and 2011



Italy

Spain

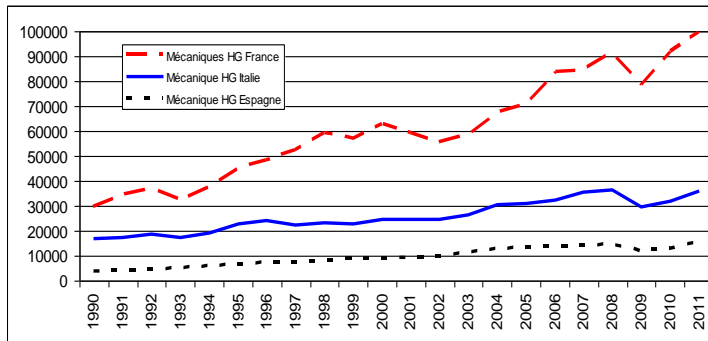
Source: Chelem Trade Data Base, CEPII, May 2014

2.1.2 The decomposition of 23 goods inside the “metal product” sector: 10 “High-end Technological Goods” and 13 “Medium-High Technological Goods”

As the metal product sector is considered as a “high added value” sector, it is important to analyse the strengths and weaknesses of the exports of the four countries inside this specific sector. In order to do this, we use the nomenclature defined by the French Centre on Research and Expertise on World Economy (“Centre d’Etudes et de Prospectives industrielles Internationales”: CEPII) and the study of Mickael Fortes (2012). M Fortes distinguishes, within the “metal products” sector, four different ranges: “High-end Technological Goods” category –HTG- (like medical instruments and precision optics), “Medium-High Technological Goods” category –MHTG- (like vehicles or electrical equipment), “Medium-Low Technological Goods category –MLTG- (like ships or other manufactured goods), and “Low-End Technological Goods” category –LTG- (like food and textiles) (table 6). This nomenclature is supported by A. Loschky’s theory (2008) which analyses the direct and indirect intensity of each good in Research and Development activity (RD activity). Naturally, inside each of the categories, the goods can also be from different levels of quality. For example, in the car sector, situated here in the MHTG, Germany is more specialised in up-market products than France.

From **Graph 6**, we observe that France is mainly specialised in the products of “High-end technology” in metal product sector whereas Italy and Spain are more specialised in Medium high technology goods in the metal product sectors. The strong progression of French nominal exports in these products is due to a specialisation turned towards “up-market goods” which authorises the highest unit prices for these products.

Graph 6: Exports of the 10 industrial “High Technological Goods” in the Metal products sector of the three studied countries from 1990 to 2011

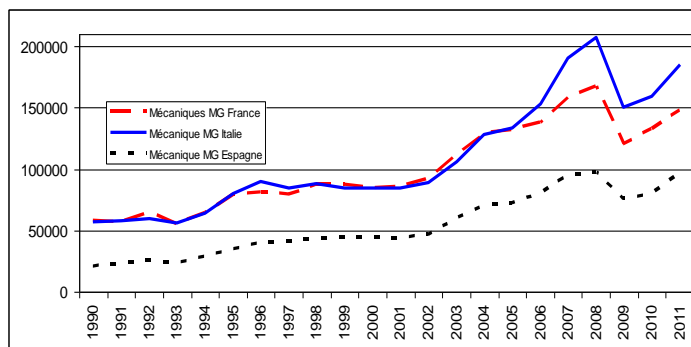


Source : Chelem Trade Data Base, CEPII, May 2014

But the increase of French exports in 10 “High-end technological” goods in the metal product sector (**appendix A3**) has not enabled the French industrial trade balance to redress itself. Concerning this point, the diversity and the quality of these French “high-end technological” goods was not sufficient enough to authorise a sharp increase in the quantity of exports on the world market. Also, during the next ten years, the competition on the world market, with the goods producing by Emerging countries not only for low technological products but also for high technological products, had increased. On the last point, it seems that the German strategy was much better because, in each category Germany made a particular effort in quality for both “high technological” products and “medium technological” products. Germany produced up-market products in all manufactured industries. In this case, it was easier for Germany to sell with high prices than France which only exported “high technological” products with “medium quality” and medium-market products.

On **graph 7**, we note the parallel progression of France and Italy in the 13 “Medium-high technology” goods in metal products sector with a sudden decrease in French Exports from 2005.

Graph 7: Exports of the 13 industrial “Medium-high technology” goods in the Metal products sector of the three studied countries from 1990 to 2011

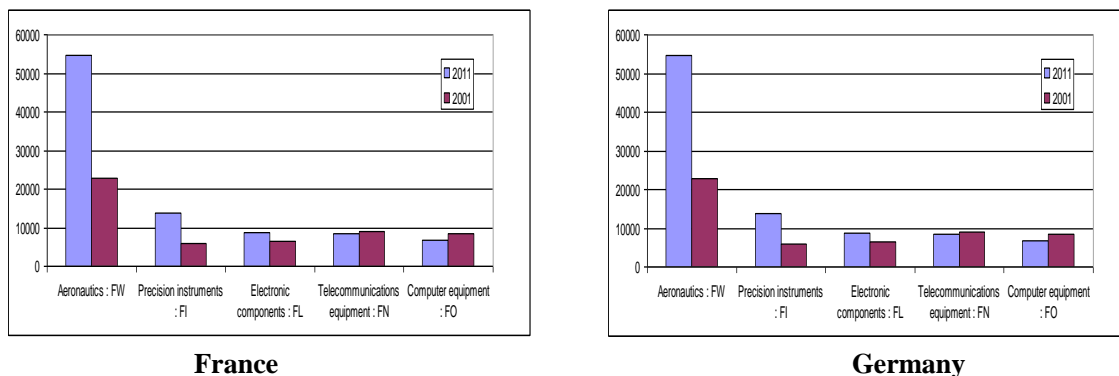


Source: Chelem Trade Data Base, CEPII, May 2014

This sudden change can be explained by the fall in the exports of French cars which belong in this “Medium-High Technology” category. In this “Medium-High Technology” category, we can see that Spain is situated, since 1990 far behind France and Italy.

Next, we analysed the evolution of the first five “High-end technology” exports in metal products sector exported by France and Germany (**graph 8**).

Graph 8: Five Best Export positions of France and German in high-end technology goods (out of the 10 high-end technology sectors) in 2001 and 2011.

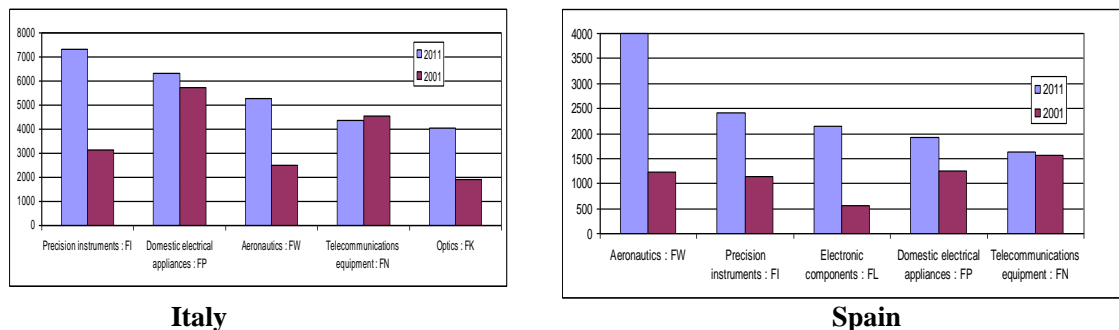


Source: Chelem Trade Data Base, CEPII, May 2014

The comparison of the five best goods in “high-end technological” goods in metal product sector for France and German is very instructive. Over ten years, France has considerably reinforced aeronautical exports, exports which have increased from 39 to 55% of the total high-end technology in metal product exports. Germany also progresses but more slowly: from only 16 to 20% of the high-end technological goods exports. On the contrary, France only slightly reinforces the exports of “measuring instruments” (which increase from 10 to 14% of the high-end technology goods exports) whereas Germany strongly increases from 20 to 28% of the high-end technology goods exports. At the same time, the French exports in “electrical components goods”, “telecommunication equipment goods” and “computers equipment goods” were stable or slowly decreased between 2001 and 2011. French exports in “electronic components” had decreased from 11 to 9% of the high-end technology goods in metal product exports. German exports decreased slightly from 14 to 13% of the German high-end technology exports in metal products sector). French exports in “telecommunications equipment” decreased from 15% in 2001 to 9% in 2011 of the high-end technology exports. For the same products and the same period, Germany exports decreased from 17 to 11%. Between 2001 and 2011, the French “computing equipment” exports decreased from 15 to 7% of the high-end technology exports. The German “computing equipment” exports decreased for the same period from 19% to 14%.

In the same way, on the **graph 9**, we have analysed the first five goods exported by Italy and Spain in the “high-end technology” metal products sector.

Graph 9: Five Best Export positions of Italy and Spain in first 5 high-end technology goods (out of the 10 high-end technology sectors) in 2001 and 2011.



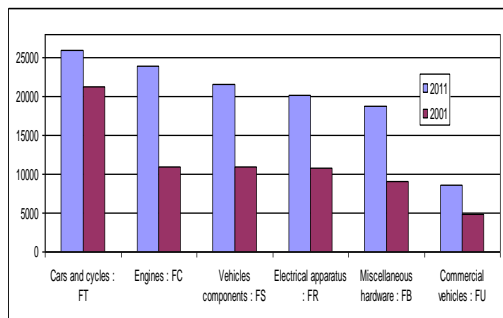
Source: Chelem Trade Data Base, CEPII, May 2014

For Italy, on the five goods the most exported in high end technology exports; three goods show a marked growth between 2001 and 2011: the exports of “measurement instruments” thereby increase from 13 to 20% of the total of high-end technology exports. Italy increased “aeronautical exports from 10 to 15% of the total of high-end technology exports. And Italy increased the “optical apparatus” exports from 8 to 11% of the total high-end technology exports. For the two goods categories where Italy is in decline, Italy loses 6 points in the “electrical appliances” exports between 2001 and 2011. Italy has also lost 7 points in the “telecommunications equipment” exports. For the latter case, the reduction in Italian exports in telecommunication is greater than the reduction of French and German exports. They only lost 6 points (from 15 to 9% for France and from 17 to 11% for Germany). But at an absolute level, Italy keeps a competitive advantage in such goods. The percentage of Italian telecommunication exports is still high with 18% of the Italian high technology exports (against only 11 and 9% for Germany and France). Between 2001 and 2011, for the five high technology exports in metal products sector from Spain, three Spanish exports have had a strong increase: “aeronautic” exports (from 14 to 26%), the “measuring instruments” exports (from 13 to 15% of the up-market exports), and the “electronic components” exports (from 6 to 14%). For the “electronic components” exports, Germany and France in turn incurred relative market share losses. Spain has a loss of exports in two goods categories: “electrical appliances” exports (from 14 to 12%) and “telecommunication equipment” exports (from 18 to 10%). In this latter case, it was the largest lost of exports across all the studied European countries.

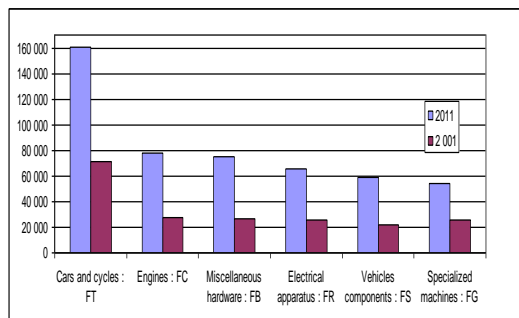
In an economic world where the competition between developed countries and emerging countries is stronger and stronger, it is important to analyse the evolution between 2001 and 2011 in “medium technology” exports inside the metal products sector because in such medium technology sectors, the price competitiveness can play a key role in winning world market shares. So we carried out the study for the goods

that are the most exported by the four European countries in the “medium high technology” category of the metal product sector (**graph 10**).

Graph 10: five strong exports of France and Germany in “medium high technology goods” in metal products sectors (out of the 13 medium high technology sectors) in 2001 and 2011



France



Germany

Source: Chelem Trade Data Base, CEPII, May 2013

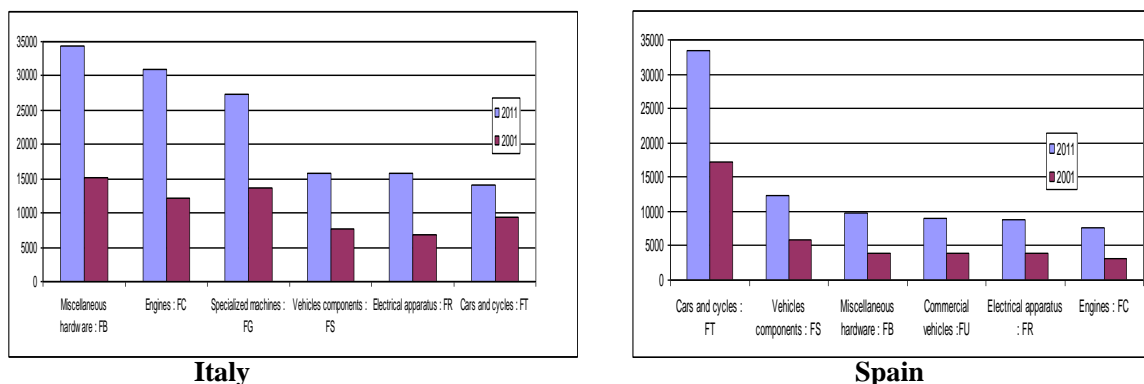
The comparison of the five strongest exports of the “medium high technology” goods for France and Germany in metal products sector is interesting. For the largest market, i.e. private cars, German exports only reduced from 29 to 26% of the medium high technology exports whereas French exports sharply reduced from 25 to 18%. With Germany being the only exception, in just 10 years France has gone from a situation of surplus in private cars to a situation of large deficit in private cars.

For the other exports of “medium high technology”, the cars exports represent 15% of the “medium high technology” exports for France whereas Germany was stable at 9%. This evolution shows how well Germany forecasted the decrease in exports of private cars towards developed countries since 2001 due to the competition of emerging countries (as Slovakia or Romania...). Moreover, Germany chose pretty early to substitute its “cars exports” by its German FDI in car sectors of the main CEEC’s. On the contrary, France followed a static strategy in its car sector. Between 2001 and 2011, France went on to produce “private cars” using both “medium high technology” and “medium quality”. Therefore, France needed more of price competitiveness, than Germany, to sell its cars on the world market. To carry out this strategy, French specialisation in cars went from “final car exports” to “components of cars” exports. France is less specialised than Germany in high added value “final car” production, sold directly to consumers worldwide. “Vehicle motors” exports represent 16% of French exports in 2011 against only 11% for Germany. “Electrical supplies” exports also represent 14% of French exports against 11% for Germany. From a less important point, miscellaneous hardware exports also represent 13% of French exports against 12% for Germany. France is less specialised than Germany in “final cars” production, with high added value, sold directly to consumers worldwide. Hence, in all the categories of “medium high technology” goods exports in metal products sector, France is always more specialised than Germany for “intermediate goods” exports which are rather sensitive to the price competitiveness rather than on “final

vehicles” with the greater added value and which are sensitive to non price competitiveness (innovation and quality).

The comparison of the five strong exports of the “medium high technology” goods in metal products sector for Italy and Spain is interesting (**graph 11**).

Graph 11: Five strong exports for Italy and Spain in “medium high technology” goods in metal products sector (out of the 13 medium high technology sectors) in 2001 and 2011



Source: Chelem Trade Data Base, CEPII, May 2014

Italian exports are stable in two categories with strong competition on the international markets: the “vehicle components” exports (9%) and the “electrical appliances”: 8%. Italy has made progress in miscellaneous hardware exports (from 18 to 19%) and in “specialised machinery” exports (15 to 16%). The main progress was chiefly seen for “motors” exports which jumped from 14 % to 17% of the medium high technology exports. For Spain the car exports decreases from 2001 to 2011 (as all the developed countries) but car exports still add up to 34% of the exported “medium high technology” exports (against 40% in 2001). Spain “vehicle component” exports stay stable at 13%. The Miscellaneous hardware exports progress slightly from 9% to 10% whereas the “commercial vehicle” exports and “electrical appliances” exports stay stable at 9% of the “medium high technology” exports for Spain in metal products sectors.

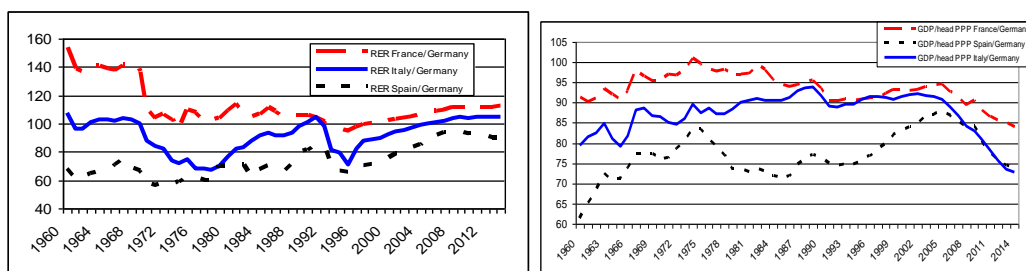
In all, France has made the choice to specialise in aeronautic and pharmaceutical goods exports, two “high technology” sectors of the metal products exports. Since 1997, Germany has chosen a dynamic double specialisation: in the “high technology” goods (as aeronautic) as well as in the “medium high technology” goods (as machinery, vehicles and equipment goods). Italy and Spain are mainly specialised in the “medium high technology” goods inside the metal products sector. Up until 2006, the “medium technology” exports for France, Italy and Spain were quite similar. But after 2006, France sharply broke free, particularly in the car sector, whereas Spain and Italy progressed in vehicles and machinery exports.

2.2 Price competitiveness losses inside Europe and the euro over-evaluation problem

2.2.1 The price competitiveness inside euro zone compared to Germany

From 1985 to 2008, the level of the price competitiveness and productivity in comparison to Germany, in PPP computation (Kravis and Lipsey, 1975), increases for Spain but decreases for France and Italy (**graph 12**).

Graph 12: Levels of Real Exchange Rates (price competitiveness¹) and productivity levels (GDP / capita in PPP dollars) compared to Germany for France, Italy and Spain 1960-2014



(1) An increase of the real exchange rates means a decrease of price competitiveness

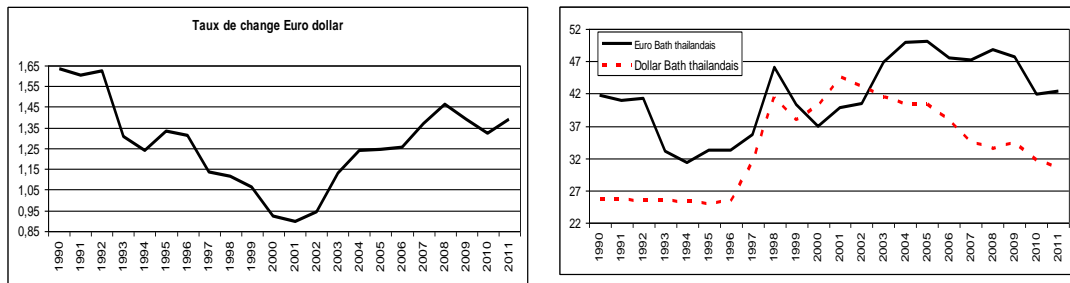
Source: Chelem GDP Data Base, CEPII, October 2014

In such a way, the GDP price levels of Spanish remain below those of Germany while those of Italy and France are higher today. For all three countries, there is an increase in their real exchange rate (so a decrease of price competitiveness) since 1996. We can measure productivity of each country by the real GDP / capita in PPP dollars. Between 1990 and 2008, we find a significant decline in the productivity of France and Italy whilst Spain's progresses. But after 2008, GDP/head of Spain is strongly dragged down in Spain due to the subprime crisis. Since 1996, the price competitiveness of European countries relative to Germany's prices, deteriorated sharply by 15, 32 and 38% for France, Italy and Spain. Over the same period (1996-2011), we observe a decrease in productivity of 2.7% for Spain, 6.2% for France and 18.6% in Italy.

2.2.2 The overvaluation of the euro against other currencies

Outside Europe, we must also emphasise the strong appreciation of the euro (**graph 13**) against the dollar between 2001 and 2011 (55%).

Graph 13: Exchange rate euro-dollar and euro Thai Baht



Source: Chelem GDP Data Base, CEPPI, October 2014

Several authors (Lafay, 2009 ; Sapir, 2012) emphasize the great danger of having a too strong currency in Europe which reduces export opportunities as well as low economic growth rate of GDP. To a lesser extent, the euro also strengthened against all emerging market currencies over the same period: 7% compared to the Thai baht, 9% against the Hungarian forint, 11% compared to Brazilian real and 21% against the Chinese Yuan.

2.3 The role of the EMU mechanism in the polarisation of trade deficits in the euro zone

2.3.1 An E.M.U. without an Optimal Currency Area ...

Further specialisation and competitiveness degradations of three European countries, the implementation of EMU mechanism may explain the French, Italian and Spanish trade deficits. Several theoretical studies (Baldwin, Forslid, 1999, Sapir, 2009, Aglietta and al, 2013) have shown that the creation of a monetary union increased returns associated with production. This lead to a concentration of production in countries that initially had the highest industrial production and greatest industrial demand (Germany, the Netherlands, Austria, Finland and Belgium). However, the free movement of knowledge (flows of innovation, R&D and human capital) should also result in a faster development for less developed countries of the “Southern countries” (France, Italy, Spain, Portugal, and Greece) (Saint Paul, 2008). In both cases, the E.M.U. is implemented in globalisation and increased global competition. The globalisation of capital flows, notably the F.D.I., has indeed affected all countries of the world: the BRICS but also the CEEC, countries in Asia, and Latin America. One consequence was the decline of the FDI intra-developed countries and intra-European countries. Moreover, membership of Emerging economies in the WTO (particularly China in 2001, Vietnam in 2005...) resulted in increased competition for Europe on the international markets. Thus the years 2000 - 2010 were marked by a sharp rise of Emerging countries in world trade. For the first time in September 2011, the trade flows for Emerging countries exceeded 50% (UNCTAD, 2011), whilst from

the 70s and 80s, three-quarters of world trade was assured by developed countries (the intra-branch trade between developed countries analysed by Krugman theory).

2.3.2 Increasing competition from Emerging countries

The growth of Emerging countries in the international arena is highly positive since this increase was accompanied by a greater standard of life (real GDP/head), most notable in the furthest behind countries. The industrialisation of these countries thus explains some industrial trade deficits in some European countries, particularly in the car industry (Lafay, 2009). However, if analysis of the new theory of international trade is accurate, developed countries should have refocused on non-price trade based on innovation and the quality of products (Helpman and Krugman, 1980). The analysis of the last twenty years does not show this trend; rather it indicates that European countries and the countries of the euro zone are rather dismembered from an industrial point of view. The North European countries, the more industrial and advanced ones, have increased, according to the Krugman theory analysis, they are specialised in the high quality industry whereas the Southern countries of the euro zone have been hampered in their industrial development, but have failed to specialise in a service and knowledge economy. The consequence of this evolution has been the rise of industrial deficits in the Southern countries of Europe. From the short and the medium term analysis, the analyses conducted by A Thirlwald (1980) and J Williamson (1985) show that countries like Spain, Portugal or Greece were in a state of economic catch-up during the eighties and must necessarily have trade deficits attributed to the import of equipment goods in order to satisfy their strong economic growth. However for France, an already well-developed country, the causes of the trade deficit must be sought in the slowdown of economic growth that could be explained by a lower investment in the export sectors. Finally, for Italy, the country continues to record industrial goods surpluses. So the three European countries studied are all different. It is important to understand the role of the specialisation factors and price competitiveness factors in the trade balance evolution of these three countries, through the estimation of the price and volume elasticities of their exports. Effectively, after the illusion that the economy had transferred itself directly to a new growth model based on a virtual economy and a knowledge economy all during the nineties, recent studies in this field (Saint- Paul, 2008) show two important things. On the one hand, it is important to balance physical capital and immaterial capital to be sure that immaterial capital disperse into material capital. On the other hand, we must not forget the industry sector because even in a post-industry society, this sector goes on to play a central role for the use of the innovations carried out in the context of the knowledge economy and so far transform innovations into real new products bought by consumers.

From 1990 to 2008, these problems have been largely overshadowed by the reform aimed at completely liberating capital movements and should lead to a global allocative efficiency (Feldstein and Horioka, 1980). The savings of more developed

countries which have traded surplus should be placed naturally in less developed countries with strong opportunities for economic investment with trade deficits. But the rise in portfolio investments had involved the monetary and financial crises of the following emerging countries throughout the 90s: Mexico in 94, Thailand in 97, Czech Republic in 97, Russia in 98, Brazil in 99 and Argentina in 2001... Moreover, the portfolio investments involved in advanced countries, diffused the US subprime crisis of 2008 and then the European sovereign debt crisis of 2010. In all these recent international financial crises, we see that capital flows, especially portfolio investments, are not only self-validating, but also extremely toxic because each phase of overvaluation in stock markets is always followed by a phase of market undervaluation in the same stock markets (Minsky, 1986, Borensztein and al, 2009, Borio and al 2010). As today, in a de-regulated world, there are no more “last resort lenders”. In such a situation, the attempts by European states to compensate the economic crisis by stabilising investment in public spending, have led to increased European public debt. Also, for the first time, the European debt has frightened international investors. The degradation of the States’ ratings by Standard and Poors Agency led to a cascade of crises at the European level and has left doubt as to whether or not there is a possibility that European countries, previously thought to be completely safe, could default. In this context, all countries with trade deficit are now affected by this distrust. The most affected countries are the weaker countries (Greece, Portugal, and Spain) or the smaller countries in euro zone (Cyprus, Slovenia and Slovakia). Even the possibility of these countries leaving the euro zone has been mentioned. But, as Krugman (2010, 2012) points out, if these countries leave the euro zone today this puts the entire euro zone under threat.

It appears that two opposite movements exist within the EMU. On the one hand, the free flow of knowledge (innovation, R&D, human capital) would promote the Southern countries (France, Italy, Spain, Portugal, and Greece) (Saint Paul, 2004, 2008). On the other hand, the EMU has shown increasing returns to scale associated with production. These returns to scale led to a concentration of production in countries that initially had industrial production and the strongest industrial demand (Germany, Netherlands, Austria, Finland, and Belgium) (Krugman, 1991, Krugman 1993, Baldwin, Forslid, 1999). In this way, the effect of the concentration of already successful industries has dominated the beneficial effect of the dissemination of knowledge. There is a most important innovative effort in the northern countries and an increasing specialisation in high-quality goods (metal products industry). In the same way, industrial demand and industrial exports are higher in the northern countries. Finally, greater productivity gains are observed in the northern European countries compared to the southern countries. To understand why the dissemination of knowledge had no effect on the southern countries, one must take into account that the positive effect of dissemination of knowledge asked for preconditions which were not met in the EMU. The free movement of knowledge (innovation, R&D, human capital) did not increase economic growth in the south because of the important growth gap between northern and southern countries and because of the lack of infrastructure in

the southern which did not allow a high economic growth rate to be supported. Consequently, the investments in southern countries went to speculative sectors (real estate markets, stocks markets, exchange rate markets) and not in the real economy (industries, services and trade...). In addition, the ability of the southern countries to accumulate knowledge and translate it into technical progress growth has been weak. Finally, the low availability of production factors (as skilled labour or performing machines) in the southern countries slowed the effect of incorporating knowledge from the northern countries.

3. ESTIMATION OF INCOME AND PRICE ELASTICITIES FOR MANUFACTURING EXPORTS OF FOUR EUROPEAN COUNTRIES

Several recent studies are extremely pessimistic about the future of the euro zone. Krugman in an article entitled "*Europe's Economic Suicide*" (published on his blog April 15, 2012) does not hesitate to say that the euro zone will soon explode. Patrick Artus, in his study of Flash Natixis n°124: "*Which euro zone countries are competitive*" February 12, 2012, underlines that France has a strong price elasticity, not only in comparison to the Germany, but also in comparison to Italy and Spain according to him. As non price competitiveness is closely linked to price competitiveness in France, the decrease of the French price competitiveness could sustainably weaken France and destroy attempts made by this country to focus on products with high non-price competitiveness (aerospace, aeronautics, chemistry, food ...). To measure the industrial products trade balance determinants in the four European countries, we have estimated income elasticities and price elasticities of industrial exports by volume, of these countries. Given the weight of the industrial sector in the various countries studied, Germany could be expected to have high income elasticity and low price elasticity. The goal of the elasticities estimations is to analyse the role of the price competitiveness and non-price competitiveness to explain the trade deficits of three European countries. Today, the non price competitiveness is now mobilising both "information management" (networks, influence, protection of intangible patrimony) and "non-price factors management" (monopolistic and oligopolistic structures) to increase the differentiation of products on the world markets (Helpman and Krugman, 1985). But price competitiveness remains a major element for a rapid trade insertion in the global economy (Hooper, Johnson and Marquez, 2000).

3.1 Modelling manufactured exports by volume of the three countries

The exports in volume data in trade CEPII data base were unavailable. So we compute export in volume in dividing nominal exports (from Chelem "trade base") of each country by GDP price deflators (from Chelem "GDP base"). We estimated income elasticities and price elasticities of these three countries by applying the standard model in an open economy (Houthakker and Magee, 1969; Marquez, 1990; Senhadji, 1998). In this model, the exports in volume of manufactured goods depends

positively (ϵx) on the country's adaptation to the world economic demand (calculated from the world real GDP in PPP dollars) and negatively ($-\eta x$) on the real exchange rate in each country expressing its price competitiveness. To isolate the influence of the rising nominal exchange rate of euro on exports of the European countries, we have introduced, separately, as in P Artus's (2012) analysis, an indicator of relative national prices expressed with respect to Germany and an indicator of the nominal exchange rate of the dollar against the euro:

$$\log(\text{Industrial Export})_{jt} = \epsilon x \log(\text{World GDP})_t + b x \log(\text{Germany P/Country j P})_t + d x \log(\text{Dollar-euro ER})_t + c$$

With the four countries j (Spain, Italy, France, and Germany):

- ϵx : the income elasticity of industrial export,
- ηx : the total price elasticity of industrial export ($b x + d x$),
- $(\text{Industrial Export})_{jt}$: Exports of industrial goods in volume of the country j for the year t (calculated by goods exports in value deflated by the GDP price index of each country),
- $(\text{World GDP})_t$: the real GDP of the world economy in PPP dollars of each year t ,
- $(\text{Germany P / Country j P})_t$: the relative price index of Germany compared to the country j in year t : an increase in the index indicates a gain in competitiveness,
- $(\text{Dollar-euro ER})_t$: the exchange rate of dollar-euro for the year t : an increase in the index indicates a gain in competitiveness of country j .

For each variable in the model, we tested their stationarity (**Appendix 2**). All variables tested are non-stationary. We tested a cointegration relationship between variables. But as this relationship was not stationary, we estimated our model with Error Correction Model (ECM) (**Appendix 3**) of the following form:

$$\begin{aligned} \Delta \log(\text{Industrial Export})_{jt} &= -a x \log(\text{Industrial Export})_{jt(-x)} + b x \log(\text{World GDP})_t \\ &- d x \log(\text{RER})_{j/\text{Germany } t} + e x \log(\text{Euro Dollar ER})_t + \\ &f x \Delta \log(\text{Industrial Export})_{jt(-x)} + g x \Delta \log(\text{World GDP})_{t(-x)} + \\ &h x \Delta \log(\text{RER})_{j/\text{Germany } t(-x)} + k x \Delta \log(\text{Euro Dollar ER})_t + c \end{aligned}$$

With $\epsilon x = b x / a x$ and $\eta x = d x / a x$ and x = the optimal number of delays

3.2 Estimated income elasticities and price elasticities of manufactured exports

The estimations of the three countries' export goods' in volume, firstly show, following the Krugman theory for advanced countries, an up-market specialisation: we find a higher income elasticity than the price elasticity (**Table 3**). The analysis of the Durbin-Watson (DW) shows that there is no autocorrelation in the estimation of the four countries (**Appendix 4**). The coefficients estimated from the elasticities, confirm

the analysis developed in the first part; with the exception of the high income elasticity of Spain, which is difficult to explain at an economic level.

Meanwhile, Germany has a stronger income elasticity than that of France and Italy and a non-significant price elasticity. With the exception of Germany, there has been a rise in price elasticity of all European countries compared with estimates made in the 80s and 90s. The globalisation of the 90s and 2000s seems to have increased the role of price competitiveness, as well as for developed countries. France is more sensitive to price competitiveness and the result found here are the same as for P Artus's² study for Spain and Italy. The rise of the euro also seems to penalise the French industrial exports more than the Italian or Spanish.

Table 3: Estimation of industrial exports in volume for four European countries (1967-2011) using the Error Corrected Model (ECM)

$$\log X_{it} = c + ax \log (\text{Real World GDP}) - bx \log (P_{i,ej}/P_{\text{Germany}}) + dx \log ER_{\text{dollar-euro}} \quad (1)$$

| | c | Income Elasticity | Price Elasticity | Dollar euro ER Elasticity | R ² | DW |
|----------------|----------|-------------------|------------------|---------------------------|----------------|------|
| France | 5.04 | 1.01 | -2.30 | 0.38 | 0.82 | 2.04 |
| Germany | -12.38 | 1.41 | Ns | 0.58 | 0.58 | 2.28 |
| Italy | 0.086 ns | 0.96 | -0.99 | 0.37 | 0.80 | 2.04 |
| Spain | -19.86 | 2.19 | -1.58 | 0.34 | 0.64 | 2.42 |

Source: Chelem Trade Data Base, CEPII, May 2014, computation: authors.

The estimation of Spanish industrial exports with the ECM method performed on the data for 1967-2011 is quantified in **Table 4** and illustrated in **Graph 14**.

Lags from January to April were introduced into the equation for all variables and we used the form that yielded the best estimate. In the long term, exports depend significantly on world GDP (2.19) and to a lesser extent the real exchange rate expressed relative to Germany (1.58). However, this effect is reinforced by the effect of the nominal exchange rate euro dollar (0.34) which determines an overall price elasticity of 1.92. In the short term, changes in indicators seem to have an opposite influence compared to the long-term ones, which could be explained by the economic conditions. Given the Spanish recession, the indicators of worldwide demand recovery (or improving competitiveness), have no effect on Spanish exports.

² In his study of Flash Economy No. 37 on the January 16, 2012, Patrick Artus underlines that the price elasticities for France (0.82), twice that of Germany (0.42), explains its price trade deficit.

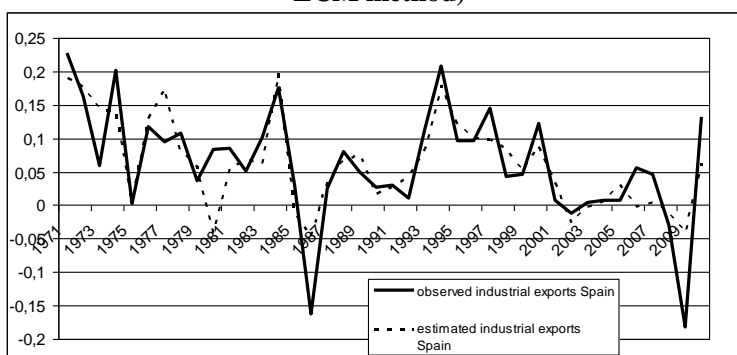
Table 4: Estimated exports of industrial goods by volume of Spain (1967-2011) by the ECM method

$$\log X_{\text{Spain}} = c + ax \log (\text{Real World GDP}) - bx \log (P_{\text{Spain}} \cdot e_{\text{Spain}} / P_{\text{Germany}}) + dx \log ER_{\text{dollar-euro}}$$

| | Estimated coefficients by <i>bootstrap</i> ² (1000000*40) | Estimated coefficients | Standard deviation | t-statistic | P-value |
|--------------------------------------|--|------------------------|--------------------|-------------|---------|
| log Industrial Export Spain (-3) | -0.4351 | -0.4351 | 0.0950 | -4.581 | 0.000 |
| log Real World GDP | 0.9562 | 0.9562 | 0.2050 | 4.665 | 0.000 |
| log RER Spain/ Germany (-1) | -0.6894 | -0.6894 | 0.1509 | -4.569 | 0.000 |
| log dollar euro Exchange Rate | 0.1489 | 0.1489 | 0.0657 | 2.264 | 0.030 |
| Constant | -8.6412 | -8.6412 | 2.209 | -3.911 | 0.000 |
| Δ log Real World GDP (2.3) | -2.9592 | -2.9592 | 0.7772 | -3.808 | 0.001 |
| Δ log RER Spain/ Germany (2.4) | 0.3692 | 0.3692 | 0.1388 | 2.660 | 0.012 |
| Δ log dollar euro Exchange Rate(2.3) | -0.1821 | 0.1821 | 0.0962 | -1.894 | 0.067 |

Source: Chelem Trade Data Base, CEPII, May 2014, computation: authors.

Graph 14: The change in exports of industrial goods in volume for Spain (1967 – 2011) (by ECM method)



Source: Chelem Trade Data Base, CEPII, May 2014, computation: authors.

It is found that the ratio t is greater than 1.96 for all variables except for the change in the exchange rate euro dollar. Similarly, the p value is less than the 5% threshold. Our sample of 44 observations therefore exceeds the threshold of 30 and the bootstrap method confirms the stability of our estimates.

4. CONCLUSION

The aim of our study was to analyse the different types of trade deficits in three European countries: Spain, Italy and France. For this we have identified three levels of analysis: total exports, industrial exports, and exports of metal products. By analysing the specialisation of countries in these sectors, we have seen that beyond the common trade deficits, the three countries were relatively differentiated and so the theory of “Comparative advantages” (Ricardo, 1815, Samuelson, 1948) is not useful here. First

of all Italy is the only country of the three economies, to experience a manufacturing surplus and a surplus in the metal product sectors. In this sector, we have seen that the exports were harmoniously distributed in both "high-tech products" and "moderately high technologies" such as hardware, engines or specialised machines. Therefore, Italy now has a specialisation constructed on the theory of "Competitive advantages" analysed by M Porter (1997) and Aghion and al (2000). Italy is situated directly on its "entire industrial value chain". This type of specialisation is far from being a coincidence since Italy built "industrial districts" in the 70s (Becattini, 1992, Baulant, 2007) on its territory suitable for a competition which has become worldwide and an action which has stayed local. At the macroeconomic level, this type of specialisation is reflected in lower price elasticities than France, unlike those observed in the 80s and 90s (Aglietta, Baulant, 1994). As a result, Italy has suffered less from the effect of price competitiveness loss relative to France. For its part, Spain has an industrial deficit which is mainly due to the rise in imports rather than the decline in its industrial exports. Spain is mainly specialised in metal product of "medium-high" technology (such as cars) and the agricultural and agri-food sector with low technology. In these sectors, the fact that Spain is the only country to have price levels below those of Germany gives this country a comparative advantage for its market price. Industrial deficit in France is less than that of Spain. However, our analysis showed that this country has probably suffered the most during the decade 2000s-2013. France had in the 90s, reoriented its trade towards metal products highly differentiated by variety. But this strategy seems halted apart from two key sectors (aerospace and pharmaceuticals). The price elasticity in French exports has risen relative to the 90s and is now at a higher level in Italy, and even superior to Spain for its total exports. The price competitiveness of France deteriorated in the 2000s compared to Germany, and France suffers, more than other European countries, in the overvaluation of the euro. The study of her specialisation has shown that the industrial specialisation is widely dispersed. We already knew that France was the "least specialised" European country. In effect, the French specialisation was too dispersed across different sectors: each efficient sector is very different from one another. For example, France exports in aeronautics, tourism, fashion, and wine! But France shows a great lack of consistency within the French industrial exports as well "high technology exports" also in "medium high technology exports". So in these two kinds of export, we only find one or two export strengths and the other exports are far behind. Moreover, France also suffers from a loss of price competitiveness on international markets. This seems to have been particularly the case for the French car industry exports which are more expensive than Spain and the Central and Eastern European countries (such as Slovakia or the Czech Republic). France seems to be "squeezed" between a "high-end specialisation" - insufficient compared to Germany- and a "medium-end specialisation" where the sectors are badly interconnected and where the price competitiveness plays a decisive role.

The analysis of foreign trade in the three European countries demonstrates that the globalisation of the 90s and 2000 acts in a paradoxical way. After a period of

growth in world trade, in all European countries between 90 and 2000 favoured by the free movement of capital, the second phase was conducted with the EMU and resulted in increasing difficulties since handicapped they were by an overvaluation of the euro. To break this “vicious circle”, EU policies must be tailored to the complexity of the world economy and, therefore, be as complex strategy very far from the old binary strategy (“high-end” versus “low-end”, industry versus agriculture...) or the old linear strategy (a “progressive rise” in range in the European specialisations).

In the long term, European countries must rethink all their specialisation by trying to find sustainable “dynamic Competitive Advantages” which are pretty far from the old comparative advantages. This new type of specialisation, of which Italy is an example, shows that specialising in the “medium range” can be more effective than a specialisation in the “high-end” if it is based on strong industrial inter-relationships and if is inserted into a comprehensive global industrial strategy. To support its long run choices of specialisation, Europe must build a medium term strategy to finance industrial policy based on the development of the innovation economy on adequate funding for these innovation structures as "venture capital" structures. As a specialisation on the intangible economy demands time, Europe must support this long run policy by managing the short-term euro exchange rate. For this, the euro must move in order to become a true currency, with a true common strategy: using the exchange rate of the euro to increase economic growth and employment, and not to lower the inflation rate in Europe. If this was the case, the euro will produce benefits instead of disadvantages, as in the past, with a heavy loss of price competitiveness and austerity policies. Finally, Europe must also be strategic in the very short term and for that managing information in the ICT Economy would be a good strategy. Today, competitiveness is multifaceted due to the mixing of price competition, imperfect competition, and information competition. On this last point, the information competitiveness will enable European countries to create “networks of knowledge” to implement new innovations on the international scene (Baulant, 2009, Pohontu et al, 2013). Europe must also globally manage information in practicing “political influence” in international institutions face to face with the rest of the world in order to compete on equal terms against the strategies of other economic areas (USA, Japan and Emerging countries).

Europe will finally be concerned with the protection of its intangible capital asset. It has already started with the implementation of the European patent (unfortunately not accepted by all European countries). Europe must protect her industrial innovations, her vegetal varieties or her specificities in cultural goods (Baulant, 2011). But Europe is still lagging behind in its presence and influence in international standardisation committees (technical, health, environmental, financial and accounting) are a means to protect its economy and innovations upstream, which would allow European countries to “anticipate their future” and the place they wish to have in the New International Economic Relations.

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APPENDIX A:
Chelem International Trade Data Base for the European Countries

A1 Export types for the four European countries in 2011
(in billions of dollars)

| | World | Germany | France | Italy | Spain |
|-----------------------------------|---------------|----------------|---------------|--------------|--------------|
| Total exports | 17,782 | 1,482 | 582 | 523 | 296 |
| - Non Manufacturing Exports | 6,356 | 219 | 134 | 96 | 75 |
| - Manufacturing Exports | 11,426 | 1,263 | 448 | 428 | 221 |
| (Of which metal products exports) | 6,424 | 803 | 247 | 221 | 113 |

Source: Chelem International Trade Data Base, CEPII, May 2014

A.2 Exports by kinds of sectors for the four CEEC's in 2011
(in billions of dollars)

| | Poland | Czech | Hungry | Slovakia |
|----------------------------------|---------------|--------------|---------------|-----------------|
| Total exports | 174 | 152 | 106 | 78 |
| - Non manufacturing exports | 63 | 21 | 16 | 12 |
| - Manufacturing exports | 138 | 131 | 90 | 66 |
| (Of which metal product exports) | 75 | 92 | 66 | 46 |

Source: Chelem Trade Data Base, CEPII, May 2014

A.3 Twenty-three components of the "metal products" section in the International Trade Chelem Base in CEPII

| Code | Rubric |
|-------------|------------------------------|
| FA | metal structures |
| FB | hardware |
| FC | engines |
| FD | farm equipment |
| FE | machine tools |
| FF | construction equipment |
| FG | specialised machines |
| FH | armament |
| FI | measuring instruments |
| FJ | watch making |
| FK | optical apparatus |
| FL | electronic components |
| FM | consumer electronics |
| FN | telecommunications equipment |
| FO | hardware |
| FP | appliances |
| FQ | electrical equipment |
| FR | electrical supplies |
| FS | elements of motor vehicles. |
| FT | passenger cars |
| FU | commercial vehicles |
| FV | ships |
| FW | aeronautics and space |

Source: de Saint Vaulvry (2008), Chelem data base - CEPII GDP trade, April 2013

A4: Twenty-two exported goods classified in high, medium high, medium low and low tech goods in Chelem data Base

| Categories | Chelem Codes | Products |
|-----------------------------------|---------------------|---|
| I. High tech goods | F | 1) Medical precision and optical instruments |
| | G | 2) Pharmacy |
| | F | 3) Radio, TV, telecommunication equipment |
| | F | 4) Computer Hardware |
| | F | 5) Aerospace |
| II. Medium high tech goods | F | 6) Railroad equipment and other transport equipment |
| | F | 7) Motor vehicles, trailers |
| | F | 8) Equipment and appliances |
| | F | 9) Machines |
| | G | 10) Chemical Product (except pharmacy) |
| III. Medium low tech goods | G | 11) Rubber & Plastics |
| | F | 12) Ships and boats |
| | C | 13) Metallurgy, non-ferrous raw transformations |
| | B | 14) Other non-metallic mineral products |
| | F | 15) Other manufactured product recovered |
| | C | 16) Metals goods (excl.) |
| | C | 17) Iron and steel, primary steel |
| | I, H | 18) Coke, petroleum and nuclear spin |
| IV. Low tech goods | E | 19) Paper, paper products, publishing |
| | D | 20) Textiles, clothing, leather shoes |
| | J, K | 21) Food, beverages, tobacco |
| | E | 22) Wood (except furniture), basket weaving |

Source: Chelem Base CEPII trade by M Fortes (2012), p5

**Appendix B:
Estimation for the industrial export equations
for Germany, Spain, France and Italy**

Stationarity tests, co integration and ECM models

B1: Study of stationary of the data (data proprieties)³

Using graph analysis and the ECM estimations, we can say that the studied data fluctuate around a linear tendency with a non null average ($\ln X = c + a \text{TREND} + \varepsilon$) because the term of 'c' and 'a' are fully significant.

The tests presented below take into account of this propriety.

ADF (4): Augmented Dickey-Fuller test (with a lag of 4)

PP: Phillips-Perron test

WS: Weighted Symmetric and Tau tests

KPSS: Kwiatkowski–Phillips–Schmidt–Shin test

The ADF (4)-PP-WS tests are given in probability value.

The KPWW-ADF/GLS tests are given in t-statistic.

Stationarity tests on exports data

| | ADF(4) | PP | WS | KPSS | ADF/GLS |
|---|---------------|-----------|-----------|-------------|----------------|
| Germany | 0.5734 | 0.2971 | 0.299 | 0.1075 | -2.6541 |
| Spain | 0.2687 | 0.5568 | 0.9998 | 0.1957 | -1.1384 |
| France | 0.136 | 0.666 | 0.9883 | 0.1664 | -1.4841 |
| Italy | 0.4776 | 0.6289 | 0.9803 | 0.1222 | -1.6933 |
| critical value at 5% | / | / | / | 0.149 | -3.19 |
| Test process: For KPSS-ADF/GLS tests, if the t-statistic is superior to the critical value, then the data is I(1) For ADF(4)-PP-WS tests, if PV > .05 then the data is I(1) | | | | | |
| Germany | I(1) | I(1) | I(1) | I(0) | I(1) |
| Spain | I(1) | I(1) | I(1) | I(1) | I(1) |
| France | I(1) | I(1) | I(1) | I(1) | I(1) |
| Italy | I(1) | I(1) | I(1) | I(0) | I(1) |

³ The authors thank the students of the Master Degree in “Economic Strategies” of University of Angers who worked, during their econometrical class 2012 - 2013, on the stationarity tests of this econometrical study.

Stationarity tests on the world demand variable

| | ADF(4) | PP | WS | KPSS | ADF/GLS |
|---|---------------|-----------|-----------|-------------|----------------|
| Germany | 0.044 | 0.2863 | 0.734 | 0.07922 | -1.2603 |
| Spain | 0.7838 | 0.7756 | 0.7838 | 0.2124 | -1.5274 |
| France | 0.8681 | 0.7068 | 0.974 | 0.1661 | -1.5076 |
| Italy | 0.4785 | 0.5833 | 0.977 | 0.13042 | -1.4802 |
| critical value at 5% | / | / | / | 0.149 | -3.19 |
| Test process: For KPSS-ADF/GLS tests, if the t-statistic is superior to the critical value, then the data is I(1) For ADF(4)-PP-WS tests, if PV > .05 then the data is I(1) | | | | | |
| Germany | I(0) | I(1) | I(1) | I(0) | I(1) |
| Spain | I(1) | I(1) | I(1) | I(1) | I(1) |
| France | I(1) | I(1) | I(1) | I(1) | I(1) |
| Italy | I(1) | I(1) | I(1) | I(0) | I(1) |

Stationarity tests on the price-competitiveness variable (or real exchange rate)

| | ADF(4) | PP | WS | KPSS | ADF/GLS |
|---|---------------|-----------|-----------|-------------|----------------|
| Germany | 0.2902 | 0.5595 | 0.8620 | 0.1518 | -1.7938 |
| Spain | 0.2286 | 0.3926 | 0.0749 | 0.1062 | -3.2092 |
| France | 0.07638 | 0.09055 | 0.02558 | 0.054 | -3.6492 |
| Italy | 0.2092 | 0.4937 | 0.1447 | 0.06637 | -2.4525 |
| critical value at % | / | / | / | 0.149 | -3.19 |
| Test process: For KPSS-ADF/GLS tests, if the t-statistic is superior to the critical value, then the data is I(1) For ADF(4)-PP-WS tests, if PV > .05 then the data is I(1) | | | | | |
| Germany | I(1) | I(1) | I(1) | I(1) | I(1) |
| Spain | I(1) | I(1) | I(1) | I(0) | I(0) |
| France | I(1) | I(1) | I(0) | I(0) | I(0) |
| Italy | I(1) | I(1) | I(1) | I(0) | I(1) |

**Stationarity test on the nominal exchange rate variable
(dollar/euro exchange rate)**

| | ADF(4) | PP | WS | KPSS | ADF/GLS |
|---|---------------|-----------|-----------|-------------|----------------|
| Germany | 0.3652 | 0.5803 | 0.2790 | 0.1151 | -2.9310 |
| Spain | 0.7885 | 0.6894 | 0.6742 | 0.1312 | -2.4372 |
| France | 0.4774 | 0.4700 | 0.2449 | 0.1163 | -2.7570 |
| Italy | 0.9206 | 0.8731 | 0.8848 | 0.1675 | -1.8257 |
| critical value at 5% | / | / | / | 0.149 | -3.19 |
| Test Processing : For KPSS-ADF/GLS if t-statistic is superior to the critical value then the series is I(1) For ADF(4)-PP-WS if PV > .05 the series is I(1) | | | | | |
| Germany | I(1) | I(1) | I(1) | I(0) | I(1) |
| Spain | I(1) | I(1) | I(1) | I(0) | I(1) |
| France | I(1) | I(1) | I(1) | I(0) | I(1) |
| Italy | I(1) | I(1) | I(1) | I(1) | I(1) |

B2: Co integration Studies:

Co integration relationships between industrial exports, real World GDP, Real exchange rate and nominal exchange rate for each country

| | P-value For Engle-Granger (tau) test* | if PV < 0,05, there is a co integration relation) |
|----------------|--|--|
| Germany | 0.98905 | no co integration relation |
| Spain | 0.62200 | no co integration relation |
| France | 0.56007 | no co integration relation |
| Italy | 0.83813 | no co integration relation |

* If PV < 0.05, there is a co integration relation

As the table shows, there no “long term” or “cointegration” relationships, so our model must be estimated by the ECM methodology.

**Appendix C: Estimation of industrial exports equations
with ECM Method:**

C1 Estimation of industrial exports in volume

Spain

$$\Delta \text{Log Export}_{jt} = -0.43 \text{ Log Export}_{jt(-3)} + 0.95 \text{ Log World GDP}_{jt} - 0.68 \text{ log RER/Germany}_{jt(-1)} + 0.14 \text{ Log dollar-euro ER}_{jt} - 2.95 \Delta \text{Log World GDP}_{jt(-2,-3)} + 0.36 \Delta \text{log RER/Germany}_{jt(-2,-4)} - 0.18 \Delta \text{Log dollar-Euro ER}_{jt(-2,-3)} - 8.64$$

In the long term, the estimations find the “expected signs” of industrial exports of Spain derived of the theory of international trade. The Spanish exports increase with the increase of the world GDP and decrease when the price competitiveness of Spain is low because of high Spanish prices or because of the high level of the euro against the dollar. So Spain’s industrial exports are positively linked to the real World GDP (2.19), negatively linked to the relative prices of Spain to Germany’s prices (-1.58) and positively linked to the nominal exchange rate of the dollar against the euro (0.34).

In the short term, we note inverse phenomena with signs contrary to the expected for all variables: the variation of Spanish exports is negatively linked to the variation of the real World GDP (-2.95), positively linked to the variation of real exchange rate of Spain relatively to Germany (0.36) and negatively linked to the variation of dollar-euro exchange rate (-0.18). So we see that Spanish exporters need some time to adapt their products to world demand and international price competitiveness.

**Estimation of industrial goods exports in volume for Spain
(1967 - 2011) by ECM methodology**

| | Estimated Coefficients | Standard Error | t-statistic | P-value |
|--|------------------------|----------------|-------------|---------|
| Log industrial Exports of Spain (-3) | -0.4351 | 0.0950 | -4.581 | 0.000 |
| Log World Real GDP in PPP dollar | 0.9562 | 0.2050 | 4.665 | 0.000 |
| Log RER of Spain relative to Germany (-1) | -0.6894 | 0.1509 | -4.569 | 0.000 |
| Log Dollar-euro Exchange Rate | 0.1489 | 0.0657 | 2.264 | 0.030 |
| Intercept | -8.6412 | 2.209 | -3.911 | 0.000 |
| Δ Log World Real GDP in PPP dollar (-2,-3) | -2.9592 | 0.7772 | -3.808 | 0.001 |
| Δ Log RER of Spain relative to Germany (-2,-4) | 0.3692 | 0.1388 | 2.660 | 0.012 |
| Δ Log Dollar-euro Exchange Rate (-2,-3) | -0.1821 | 0.0962 | -1.894 | 0.067 |

France

$$\Delta \text{Log Export}_{jt} = -0.57 \text{ Log Export}_{jt(-1)} + 2.14 \text{ Log real world GDP}_{jt} - 1.56 \text{ Log real world GDP}_{jt(-2)} - 0.78 \text{ log RER/Germany}_{jt(-1)} - 0.54 \text{ log RER/Germany}_{jt(-3)} + 0.35 \text{ Log}$$

dollar-euro $ER_{jt} - 0.13 \text{ Log dollar-euro } ER_{jt(-4)} - 0.33 \Delta \text{Log Export}_{jt(-3,-4)} + 2.42 \Delta \text{Log real world GDP}_{jt(-3,-4)} - 0.36 \Delta \text{log RER/Germany}_{jt} - 0.17 \Delta \text{Log dollar-euro } ER_{jt(-2,-3)} + 2.89$

In the long term relationship, we can see without any surprise, that the industrial exports of France depend positively (but less than for Germany) on the evolution of the real world GDP (1.01). On the contrary, the French exports depend strongly and negatively on the real exchange rate computed relatively to Germany (-2.30) and positively on the nominal exchange rate dollar-euro (0.38). In the long term, the increase of euro dollar exchange rate decreases French exports and German exports remain unchanged.

In the short term, the variations of French exports positively depend on the variation of the world GDP (2.42) and negatively depend on the variation of the real exchange rate computed to Germany (-0.36). They curiously negatively depend on the variation of the nominal exchange rate of the dollar euro (-0.17). So the increase of the dollar euro rate increases, it does not increase French exports in the short term but only in the long term. Finally, we can see the negative strong speed of adjustment (-0.33) on the variation of the French exports.

Estimation of industrial goods exports in volume for France (1967 - 2011) with ECM methodology

| | Estimated Coefficients | Standard deviation | t-statistic | P-value |
|--|-------------------------------|---------------------------|--------------------|----------------|
| Log industrial Export of France (-1) | -0.5744 | 0.09274 | -6.1936 | 0.000 |
| Log world GDP | 2.1434 | 0.2723 | 7.8707 | 0.000 |
| Log world GDP (-2) | -1.5626 | 0.2604 | -6.0003 | 0.000 |
| Log RER France/Germany (-1) | -0.7828 | 0.1519 | -5.1508 | 0.000 |
| Log RER France/Germany (-3) | -0.5412 | 0.1117 | -4.8441 | 0.000 |
| Log dollar-euro ER | 0.3543 | 0.0515 | 6.8804 | 0.000 |
| Log dollar-euro ER(-4) | -0.1343 | 0.04584 | -2.9312 | 0.007 |
| Intercept | 2.8971 | 0.8915 | 3.2494 | 0.003 |
| $\Delta \text{ log industrial Export France } (-3,-4)$ | -0.3320 | 0.1240 | -2.6768 | 0.012 |
| $\Delta \text{ Log world GDP } (-3,-4)$ | 2.4231 | 0.6537 | 3.6912 | 0.001 |
| $\Delta \text{ Log TCR France/Allemagne}$ | -0.3659 | 0.1941 | -1.8844 | 0.070 |
| $\Delta \text{ Log TC dollar-euro } (-2,-3)$ | -0.1705 | 0.0828 | -2.0578 | 0.049 |

Italy

$\Delta \text{Log Export}_{jt} = - 0.87 \text{ Log Export}_{jt(-1)} + 1.75 \text{ Log world GDP}_{jt(-1)} - 0.90 \text{ Log world GDP}_{jt(-4)} - 0.43 \text{ log RER/Germany}_{jt(-1)} - 0.42 \text{ log RER/Germany}_{jt(-3)} + 0.33 \text{ Log Euro-dollar } ER_{jt} + 1.90 \Delta \text{Log world GDP}_{jt} - 0.29 \Delta \text{log RER/Germany}_{jt(0,-3)} - 0.21 \Delta \text{Log Export}_{jt(-3,-4)} - 0.07$

In the long term relation, the exports of Italy depend positively the world GDP (0.96), negatively to the real exchange rate computed to Germany (-0.99) and positively to the dollar-euro nominal exchange rate (0.37).

In the short term, the variations of the Italian exports positively depend to the variation of the world GDP (1.90), negatively to the variation of the real exchange rate computed to Germany (-0.29) with a negative speed of adjustment of the endogenous variable (-0.21). The dollar-euro nominal exchange rate doesn't play a role in the short term for Italy.

Estimation of industrial goods exports in volume for Italy (1967 - 2011) with ECM methodology

| | Estimated Coefficients | Standard deviation | t-statistic | P-value |
|---|-------------------------------|---------------------------|--------------------|----------------|
| Log Industrial Exports Italy (-1) | -0.8777 | 0.1340 | -6.5495 | 0.000 |
| Log world GDP (-1) | 1.7549 | 0.4455 | 3.9387 | 0.000 |
| Log world GDP (-4) | -0.9089 | 0.3747 | -2.4257 | 0.022 |
| Log RER Italy/Germany (-1) | -0.4389 | 0.1742 | -2.5192 | 0.017 |
| Log RER Italy/Germany (-3) | -0.4296 | 0.1802 | -2.3830 | 0.024 |
| Log dollar-euro ER | 0.3321 | 0.0647 | 5.1285 | 0.000 |
| Intercept | -0.07625 | 0.6004 | -0.1270 | 0.900 |
| Δ Log Industrial Exports Italy (-3,-4) | -0.2133 | 0.1130 | -1.8878 | 0.069 |
| Δ Log world GDP | 1.9041 | 0.4879 | 3.9019 | 0.000 |
| Δ Log RER Italy/Germany (0,-3) | -0.2931 | 0.1377 | -2.1273 | 0.042 |

Germany

$$\Delta \text{Log Export}_{jt} = -0.34 \text{Log Export}_{jt(-3)} + 0.49 \text{Log world GDP}_{jt(-1)} + 0.20 \text{Log dollar-euro ER}_{jt} - 0.33 \Delta \text{Log Export}_{jt(-1,-2)} + 3.07 \Delta \text{Log world GDP}_{jt} + 0.40 \Delta \text{log RER/France}_{jt(-2,-4)} - 0.31 \Delta \text{Log dollar-Euro ER}_{jt(-2,-3)} - 4.12$$

In the long term, the industrial exports of Germany positively depend on the world GDP (1.41) and to the dollar-euro ER (0.58). The real exchange rate of Germany computed relatively to France does not play a role in Germany's exports evolution.

In the short term, the variation of Germany's exports is highly positively influenced by the variation of the world GDP (3.07), positively influenced by the variation of the real exchange rate of the Germany relatively to France (0.40) and negatively by the variation of the dollar-euro exchange rate (-0.37) and at last the negative influence of the variation of the endogenous variable (-0.33).

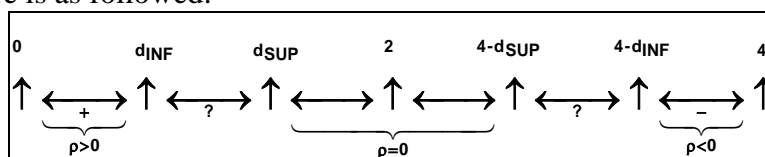
Estimation of industrial goods exports in volume for Germany (1967 - 2011) with ECM methodology

| | Estimated Coefficients | Standard deviation | t-statistic | P-value |
|--|------------------------|--------------------|-------------|---------|
| Log industrial Export Germany (-3) | -0.3468 | 0.1197 | -2.8954 | 0.007 |
| Log world GDP (-1) | 0.4919 | 0.1546 | 3.1817 | 0.003 |
| Log dollar-euro ER | 0.2030 | 0.0738 | 2.7508 | 0.010 |
| Intercept | -4.1212 | 1.2954 | -3.1821 | 0.003 |
| Δ Log industrial Export Germany (-1,-2) | -0.3329 | 0.1434 | -2.3217 | 0.027 |
| Δ Log world GDP | 3.0726 | 0.6967 | 4.4098 | 0.000 |
| Δ Log RER Germany/France (-2,-4) | 0.4099 | 0.1441 | 2.8447 | 0.008 |
| Δ Log dollar-euro ER (-2,-3) | -0.3154 | 0.1103 | -2.8585 | 0.007 |

C 2: Econometrical tests on industrial exports in volume

| Endogenous variable: | Δ Log Export Germany | Δ Log Export Spain | Δ Log Export France | Δ Log Export Italy |
|--------------------------------------|-----------------------------|---------------------------|----------------------------|---------------------------|
| Sample | 1967 to 2011 | 1967 to 2011 | 1967 to 2011 | 1967 to 2011 |
| Number of Observations | 40 | 40 | 40 | 40 |
| Variance of residuals | 0.003659 | 0.002971 | 0.001250 | 0.001788 |
| R ² | 0.5842 | 0.6482 | 0.8256 | 0.8045 |
| Adjusted R ² | 0.4932 | 0.5713 | 0.7572 | 0.7458 |
| Durbin-Watson | 2.28 | 2.42 | 2.04 | 2.04 |
| Arch Test | 0.0003 | 0.014 | 0.00009 | 0.888 |
| Fisher Test (R ² nullity) | 6.42 | 8.42 | 12.05 | 13.71 |
| Akaike Information Criteria | -51.91 | -56.08 | -72.06 | -65.51 |

The DW statistic tests the autocorrelation of residuals in the order 1. The study of this DW shows that there is no autocorrelation in the estimation of France and Italy (the DW is closed to 2). But the estimation is not so good for Spain and Germany. The DW statistic is between 2.21 and 2.77. In the last case, there is an non determination. The test procedure is as followed:



Then we search in the DW table the two value of d_{inf} and d_{sup} (here it is 1.23 and 1.79 respectively for the 5% critical value), then we look at which interval belongs to the value of DW for confirming or infirming an autocorrelation of residuals.

The Arch test computes the conditional autoregressive heteroscedasticity. The critical

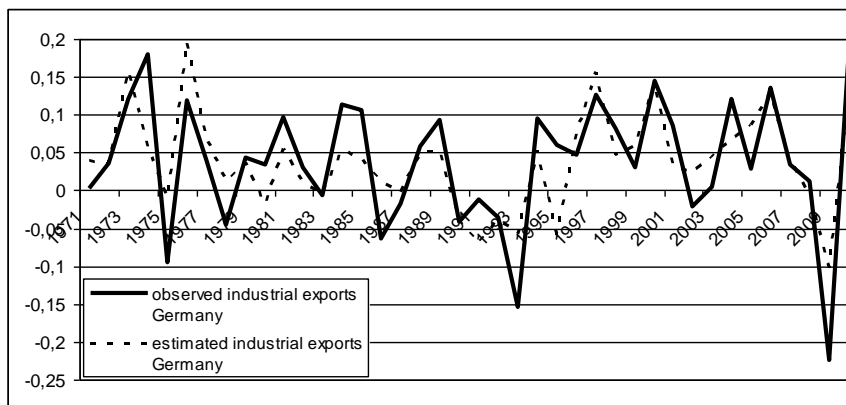
value is 3.841 at 5% (in a Chi-two Table at 1 degree of liberty). So there is no arch effect for all the studied countries.

The Fisher test computes the nullity of R^2 . The critical data reference is 4.46 in the Fisher table (5.34), so the R^2 is not null for all the studied countries.

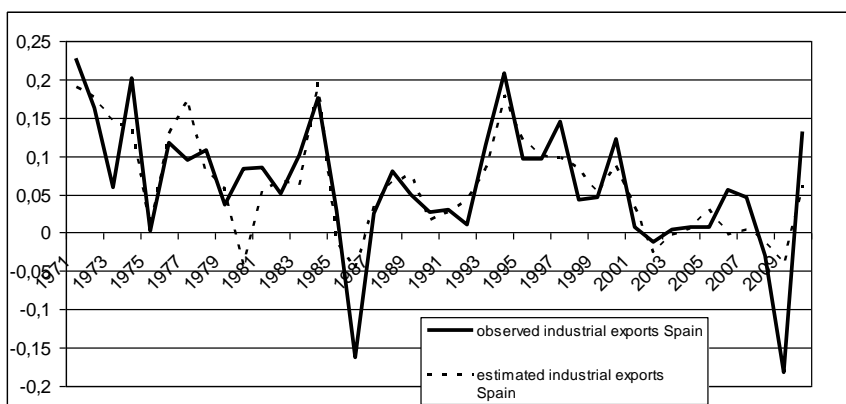
The Akaike Information Criteria (AIC) test determines the best lag to put in our equation. In our study, we choose four lags for the four studied countries and for all the tested variables.

C3: Charts of observed exports and estimated exports:

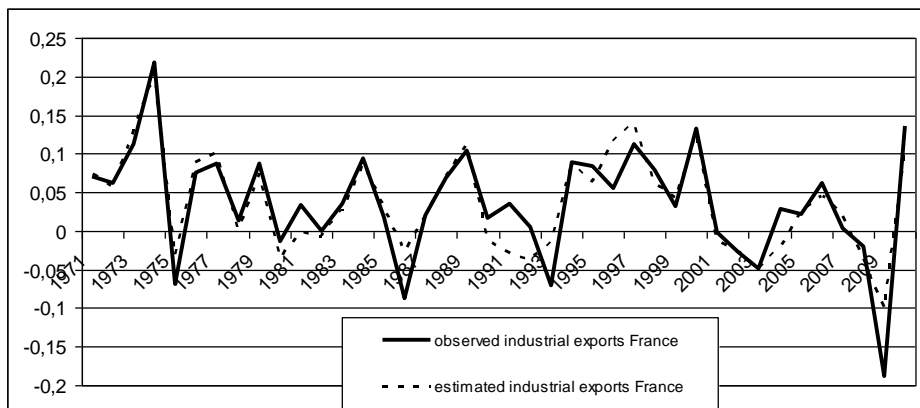
Estimation of industrial exports of Germany (with EMC methodology), 1967 to 2011



Estimation of industrial exports of Spain (with EMC methodology), 1967 to 2011



Estimation of industrial exports of France (with EMC methodology), 1967 to 2011



Estimation of industrial exports of Italy (with EMC methodology), 1967 to 2011

